

**The Role of Government Policy for Health:
Equity versus Efficiency or Poverty versus Fiscal Vulnerability**

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Abstract

Since the 1980s, many developing countries have been adjusting to severe macro economic imbalances. There has been a concern that the accompanying changes in fiscal policy may be having a detrimental effect on the health status of these populations. To examine the relationships between changes in fiscal policy and health, a "social matrix" is developed which captures how the equity structure of the fiscal system can influence the efficiency with which health-related inputs are combined. It is the principal conclusion of this paper that household responses to changes in public policy can best be elucidated for a given society when the "social matrix" underlying the structure of the fiscal system is adequately specified. In contrast to other studies which look at poverty or vulnerability in general, this approach draws attentions to those who are fiscally vulnerable, that is, those who are dependent on public subsidies and as a result experience a fall in living standards (full income) when these subsidies are removed.

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1. INTRODUCTION

Many countries starting from the late 1970's had to adjust to severe macro economic imbalances. These circumstances and adjustments created a concern as to their impact on past and future gains in health status in developing countries. For example, in the late 1980's UNICEF suggested that the erosion of public commitment to social programs could have dire consequences to the health of the poor and vulnerable segments of society (Cornia, Jolly and Stewart, 1987). They recommended a balanced approach with a "human face." The World Bank was equally concerned, especially with the financial viability of the public health system (World Bank, 1987). In 1987, it proposed an innovative "Agenda for Reform" that recommended a shift in the responsibility of health care finance towards the private sector, while attempting to maintain an acceptable compromise between equity, efficiency and effectiveness. A major concern was how shifts in the provision and financing of health-related services from the public to the private sector would affect health status. In this paper, we focus on the public sector and how changes in the distribution of public subsidies for health services may affect health status.

The question of how public support for health care finance will be replaced, and by whom, as government withdraws its

commitments should consider how the overall pattern of government subsidies in health and health-related activities influence household demand for health and accordingly health services utilization. The household production of health depends on the efficient combination of the proximate determinants to health within the household budget. Government policy affects the availability and distribution of the proximate determinants necessary for the production of health. This means that the equity structure of the fiscal system can influence the efficiency with which health-related inputs are combined. The linkages between equity and efficiency as they pertain to health promotion create what we term the "social matrix" for a given society. It is the principal conclusion of this paper that household responses to changes in public policy can best be elucidated for a given society when the "social matrix" underlying the structure of the fiscal system is adequately specified. Within the fiscal system, we attempt to differentiate the forces that influence the efficiency in health production from those implying equity considerations. To date, there has been little systematic analysis of the efficiency versus distributional motives for various macro policies in health (Behrman and Deolalikar, 1988).

The social matrix highlights a particular aspect of equity, namely, "fiscal vulnerability". The fiscally vulnerable are those who experience a fall in living standards (full income) as a result of a secular decrease in public expenditure. Other

studies which examine the impact of structural adjustment programs on income distribution focus on the poor, as defined by traditional indicators of poverty (money-metric poverty line measures), income distribution (Gini coefficients), primary incomes and wages (Bourguignon, de Melo, Morrisson, 1991; Bourguignon, de Melo, Suwa, 1991; Lambert, Schneider, Suwa, 1991; Sahn, 1990). In some cases, the terms "poverty" and "vulnerability" are used interchangeably (Jolly, 1985). In this discussion, we do not attempt to deal with all vulnerable groups; rather, we are concerned with those households whose living standards are threatened by changes in fiscal policy.

We develop the concept of the social matrix by starting with a discussion of its foundation in previous literature. Next, we present the conceptual framework underlying the social matrix. Third, we apply the framework by reviewing existing evidence from two empirical studies of the Ivory Coast and the Sudan in terms of the social matrix. Finally, we conclude with a discussion of the implication of the social matrix for future research design and policy analysis. The fiscal system affects both income (earned and unearned) and prices. The primary objective of the social matrix is to trace these price and income effects to assess the impact of fiscal policy on health promotion. Improved data collection and analysis of real income effects is essential.

2.0 PREVIOUS RESEARCH

This social matrix builds on four major issues identified in the previous literature. First, in addressing the impact of stabilization and adjustments on income distribution, most studies have taken as their starting point the onset of the crisis and the initiating of policy measures to restore macro-economic balance; they use counterfactual analysis, a comparison of the economy's actual path with that which it would have taken under different policies (Bourguignon, de Melo, Morrisson, 1991; Bourguignon, de Melo, Suwa, 1991; Scobie, 1989; Sarris, 1990). Not much attention has been paid to changes in income distribution and in associated patterns of household resource allocation that accompanied the pre-adjustment policies that lead to the crisis. Rather, concern for how the country arrived at its present state has focused primarily on whether the macroeconomic imbalances are perceived as temporary or permanent. It is our view that such lack of attention to the preexisting relationships of fiscal policy and income distribution could significantly affect understanding the impact.

Second, studies have shown that the question of health status/health service utilization response to income and prices may not be adequately estimated because of methodological problems of estimating income elasticities which arise when persons or goods are aggregated (Alderman, 1990; Bouis and Haddad, 1988). Later studies which disaggregate across persons and goods find smaller income effects (Behrman and Deolalikar,

1987; Strauss and Thomas, 1989; Bhargava, 1991). These more recent studies took as a point of departure the income impact on nutrient intake in a relative sense, i.e., "the impacts on the adequacy of these intakes relative to needs" (Ravallion, 1991). We take it as a point of departure in the present analysis that it is also the insensitivity of the income being measured in most surveys and studies to the contribution of public policies to families' full income (i.e. that includes the value of public and private income and price subsidies received by the household) that may cause significant unknown biases in estimating the impact of change in public policies in general and structural adjustment in particular on the health status and health service utilization of families and individuals.

Third, our analysis sheds light on the issues of substitution. It has been argued that as income declines, households undertake a process of resource reallocation leading to the substitution of inefficient health and health-related inputs to more efficient ones (Behrman, 1988a; Scobie, 1989). In one sense, the harshness of the adjustment process may be desirable. It may have a net welfare benefit in terms of reducing inefficiency in household health-related activities. This hypothesis, although comforting as a rationalization of a given policy, lacks adequate conceptual and empirical foundation. On the conceptual level there are two groups of poor people: those who are poor independent of government policies and those who are poor as a result of change in government policies. The

first group should have their substitution effect already in place. But do they? The second group needs careful identification based on the distribution of benefits and accordingly, a pre-post policy analysis. Furthermore, the presence of alternative options becomes a key factor that needs examining (Alderman and Gertler, 1989). More fundamental, if according to some findings, health status did not deteriorate significantly during the period of adjustment, the reason may be partly a more efficient reallocation of resources within the household, partly a result of a changing pattern of income distribution, but it could also have implications for the efficiency of public programs.

Fourth, our analysis focuses on what we label the social matrix of society in order to evaluate pre- and post-changes in government policies. It provides a richer mode of analysis that gives quantitative and qualitative assessment. It provides a more solid foundation for clarifying the important distinction between the poor and the vulnerable.

3.0 CONCEPTUAL FRAMEWORK

(a) Background

In this section, the relationships between public policies and health are developed more fully using an economic model of individual behavior. Structural adjustment policies are complex; discussing all adjustment policies is not feasible in a single

study, so we focus on instruments aimed at restricting real income and components that curtail public health expenditures. Ultimately, most structural policies affect households by altering the level and composition of their full income (Behrman, 1988b). To elucidate household responses to changes in public policy, therefore, an underlying classification of households by potential full income effects of structural adjustment is useful, where the classification highlights the linkages between full income and health.

Most previous studies implicitly or explicitly assume that government policies are designed to improve the full incomes of the poor. Following this assumption, most studies of the equity implications of structural adjustment have focused on the poor. In reality, substantial evidence exists to the contrary, namely, that many public programs often do not reach the poor (Bourguignon, de Melo, Morrisson; 1991). If public policy reaches groups other than the poor, then one must reassess who are the vulnerable when public policy is adjusted, that is, who faces welfare losses as full incomes change. This leads us to define "fiscal vulnerability". The fiscally vulnerable are those who experience a fall in full income as a result of a secular decrease in public expenditure.

Determining fiscal vulnerability to structural adjustment programs depends critically on the degree to which households are integrated into formal markets (Sahn, 1990; Behrman, 1988b). In particular, we classify households by whether or not they have

access to any one of four major government policies affecting full income: (1) households living in communities where public expenditures are allocated to ameliorate community environmental conditions; (2) households with access to subsidized prices, primarily of health-related goods; (3) households with access to subsidized family unearned income; and (4) households with access to subsidies for family earned income. Government policies affect health especially through prices, primarily for health-related inputs, community endowments and income transfers.

For example the effects of adjustment on curative services - on the availability of medical supplies, on expansion of services, on quality of care, on higher user fees, and on costs as a result of higher import prices - are likely to have a negative effect on health (Diop, Hill, Sirageldin; 1991 and Sirageldin and Diop, 1991). This effect will be most marked for those who, in earlier periods, used the services most intensively. The urban population, perhaps most of all the urban middle class, may thus be affected¹.

The contrast between fiscal vulnerability, general vulnerability, and poverty can also be seen in discussions of the political sustainability of structural adjustment packages (Bourguignon, de Melo, Morrisson; 1991). Stabilization and adjustment measures may fail because they do not take into account the resistance of those whose standard of living will fall as a result of the measures, often the urban middle class or civil servants.

(b) The Model

In this model, we conceptualize the health of an individual as a durable good, referred to as the stock of health. This has a desirable level which can be maintained by a variety of inputs. The stock of health is the individual's capacity to combat disease. This treatment follows a growing tradition in economics (Cropper 1977; Grossman 1972; Muurinen and Le Grand 1985). The level of child health that the family can attain is constrained by the family's financial and non-financial resources and its economic environment.

It will be assumed that health has value or utility (U) in itself because it augments the welfare of an individual's family. This is shown in equation (1). Health stock (H) results in healthy days (h) as shown in equation (2).

$$(1) \quad V = \int_0^T a(t) U[C(t), h(t)] dt; \quad U_c, U_h > 0;$$

$$(2) \quad h(t) = f[H(t)]; \quad f_1 > 0, f_{11} < 0;$$

V	=	time discounted utility
U	=	utility derived from health days and consumption at time t
C(t)	=	composite consumption good
a(t)	=	time discount function
h(t)	=	healthy days produced from health stock of an individual born at time 0
H(t)	=	Health Stock at time t

A household member is assumed to be innately endowed with an initial stock of health at birth, which is partially determined by inherited biological characteristics. Given the random

distribution of biological characteristics in a cohort of births, it is assumed that the level of this initial stock of health bears little on the variability of health status between socioeconomic groups and their changes over time.

The initial stock of health is continuously increased by the household's engagement in health-promoting activities on the one hand. Families engage in new investment in health by purchasing medical goods (M) and/or using traditional medical inputs (X) based on the knowledge, K_t , they have accumulated on health technologies by time t . On the other hand, the individual's exposure to diseases prevalent in his/her community deteriorates that individual's capacity to combat disease. The former component of changes in health stock can be viewed as gross-investment in a person's health; the latter, as the use-intensity of the child's health. In summary, over some period of time, the change in an individual's health status, $[H(t)]$, can be viewed as the outcome of the investment (I) in and depreciation (d) of health stock. This is expressed verbally in equation (3a) and mathematically in equation (3b).

$$(3a) \quad \left[\begin{array}{c} \text{Change of} \\ \text{Individual} \\ \text{Health over} \\ \text{Time} \end{array} \right] = \left[\begin{array}{c} \text{Outcome of} \\ \text{Health} \\ \text{Promoting} \\ \text{Activities} \end{array} \right] - \left[\begin{array}{c} \text{Deterioration} \\ \text{of Individual} \\ \text{Health} \end{array} \right]$$

$$(3b) \quad \dot{H}_t = I[M(t), X(t); K_t] - d(t; E_t) H(t);$$

$I(t)$	=	gross investment in health
$M(t)$	=	purchased modern medical goods or services at time t
$X(t)$	=	purchased traditional medical inputs at time t
K_t	=	knowledge about health technologies at time t
$d(t; E_t)$	=	rate of depreciation of health stock
E_t	=	vector of physical environmental variables describing the community where the individual lives
I_1, I_2	=	marginal productivities of modern and traditional medical inputs, respectively $I_1, I_2 > 0$.

As with other commodities produced within the household, the level of health that a family can attain is constrained by its financial and nonfinancial resources and its economic environment. The family's wealth, W_t , is assumed to change over time according to equation (4).

$$(4) \dot{W}_t = r\theta W_p + Y(t) - [c(t)C(t) + \{m(t) + F_M\}M(t) + \{x(t) + F_X\}X(t)];$$

r	=	real interest rate
θ	=	$1 + s$, degree of subsidy
s	=	subsidy rate
W_p	=	consumer purchase price of unearned wealth (e.g. assets)
W_t	=	θW_p = actual market value of unearned wealth
$r\theta W_p$	=	annual value of actual unearned wealth
$Y(t)$	=	earned income at time t
$C(t)$	=	composite consumption good
$c(t)$	=	the price of $C(t)$
$M(t)$	=	modern medical inputs
$m(t)$	=	monetary price of $M(t)$
F_M	=	lost income associated with purchase of $M(t)$
$X(t)$	=	traditional medical inputs
$x(t)$	=	monetary price of $X(t)$
F_X	=	lost income associated with use of X ;

Family wealth includes both earned (Y) and unearned (W_u) income. In the presence of government subsidies, the actual market value of unearned income may be more than the purchase price paid by the family for the particular asset, (W_p). The ratio of the market value to the purchase value of unearned wealth, (W_u/W_p), indicates the degree of government subsidy (θ) on unearned wealth². This rate depends on a multitude of factors such as those described in the previous section: exposure to public community environment programs, dependence of subsistence farming, degree of integration into the market economy, age, sex, ethnic group. Government policy determines the amount of the subsidy program and the target population. Annually, the income from wealth depends on the real interest rate, (r).

This representation of wealth allows one to explicitly consider several aspects of government subsidization on health status. First, family wealth is derived from both the purchase price and the subsidized portion of wealth, ($r\theta=r+rs$). Second, expenditures are specified to include the cash and time costs of seeking medical care which are included in most health care demand models (Acton, 1975; Akin et. al., 1981; Heller, 1982). Public policy may directly affect the price of medical care. Third, public policy may affect earned income through wage controls or other employment policies such as food for work programs. The wealth constraint can be much more elaborately specified to capture all the ways in which fiscal policies affect household income. The specification chosen is deemed sufficient

to demonstrate the concepts behind the social matrix. Moreover, a comprehensive specification is likely to be country-specific.

The objective of the family is to choose a path over time of consumption of other goods, $C(t)$, and a path over time of gross investment in each family member's health by using modern health inputs $M(t)$, and/or traditional inputs $X(t)$ in order to maximize family welfare. The family faces two constraints: a bio-technical constraint of health production, as shown in equation (3), and a wealth constraint, which is represented in (4). The constrained dynamic optimization problem is presented in equation (5).

$$(5) \quad A = a(t) U\{C(t), f[H(t)]\} + y^h(t) \dot{H} + y^w(t) \dot{W}_a + y^w(t) \dot{W}_a$$

A = Dynamic versions of Hamiltonian
 y^h = costate variable of $H(t)$
 y^w = costate variable of $W_a(t)$

It can be solved to understand the effect of government policy on health. Assuming that all types of medical inputs are used, the necessary conditions which satisfy this dynamic problem are presented in equations (6-7).

$$(6) \quad \frac{U_{h1}}{u} = p(t) [d(t;E) - (r\theta + \phi)]$$

$$(7a) \quad I_1 p(t) = m(t) + F_M i$$

$$(7b) \quad I_2 p(t) = x(t) + F_X i$$

U_h	=	marginal utility of healthy days
f_1	=	$\partial h / \partial H$
u	=	marginal utility of wealth, discounted
$p(t)$	=	effective marginal cost of new health investment
ϕ	=	percent change in marginal cost of new health investment, $p(t)$
$d(t;E)$	=	depreciation of health stock
$r\theta + \phi$	=	cost of wealth (with subsidized portion)

The first condition presented in equation (6) identifies the optimal health stock which maximizes household welfare within the biotechnical and wealth constraints. Given this optimal health stock, the second condition (7a-7b) determines the cost minimizing combinations of types of medical inputs to produce it. The interpretation of equation (6) is that the marginal benefits of health, $U_h f_1$, standardized by the marginal benefits of wealth, u , are equal to the user cost of health capital, $d(t;E)$ standardized by the marginal costs of wealth, $(r\theta + \phi)$. Equations (7a) and (7b) represent the typical cost minimization conditions; the household chooses a combination of inputs where the marginal value product of an input equals its marginal cost.

(c) The Social Matrix

With this framework, the linkages between equity and efficiency become clearer. Through government policies affecting full income, the equity structure of the fiscal system can influence the efficiency with which health-related inputs are combined by changing their marginal costs and marginal benefits,

resulting in different levels of health status. As shown in Table 1, government policy operates through the social matrix in primarily four ways. First, for households living in communities where public expenditure are allocated to ameliorate community environmental conditions, depreciation costs of health status will be affected. Second, for households with access to subsidized prices, primarily of health-related inputs, the marginal cost of improving the health stock will change through the price variable, $p(t)$. Third, households with access to subsidized family unearned income, such as housing, will have a different marginal cost of maintaining health status as shown by the change in the user cost of health capital. Finally, households with access to subsidies on earned income will be affected through changes in the marginal utility of market value of wealth, W_1 . Notably, the first three types of government policy changes (public expenditures on environment, public expenditures on medical inputs, subsidies on unearned wealth which are not health-related) affect the user cost of health capital. The latter government policy (changes in earned income) affects the marginal benefits of health stock. The effect of each type of government policy on health is demonstrated below.

[Insert Table 1 here]

To illustrate how inequalities in health develop among socioeconomic groups and how the inequalities may change during

economic crises and structural adjustment, equation (6) is represented graphically, as shown in figure 1. The marginal benefits (MB) curve represents the right-hand side of the equality in (6). The slope of MB is based on the assumption that, as an individual becomes healthier, the marginal benefit from increasing his or her health gets smaller. The marginal cost (MC) curve represents the left-hand side of the equality in (6). The constant slope of the marginal costs (MC) curve is based on the simplifying assumption that increases in the costs of health-promoting activities are independent of the level of health stock. The relative positions of the MB and MC curves summarize the environment of the family, and H^* indicates the level of health the individual can achieve in this environment.

[Insert figure 1 here]

(i) Public expenditures on community environmental conditions

Using figure 1, assume that Type I and Type II families have similar characteristics except that Type I families reside in an area with adequate community-level public health programs, while Type II families do not. Type II families face greater exposure to environmental contamination, thus their depreciation costs are higher. Moreover, they face higher effective marginal cost of new health investment, $p(t)$ because the price of access to modern medical care is likely to be higher.³ Type II families will achieve a lower level of health, H_{II}^* , than Type I families, H_I^* ,

other things being equal. If structural adjustment reduces public expenditures for these public health programs, then the health stock of Type I families will deteriorate; the health status of Type II families will remain unchanged.

(ii) Public subsidies for prices of health inputs

In this case, also using figure 1, assume that Type I and Type II families have similar characteristics except that Type I families reside in an area with available and accessible modern public health services, while Type II families do not. Type II families will have to pay more to obtain modern medical care; therefore, they will not be able to achieve the same health status as Type I families. If public support of modern health care services is removed, the health status of Type I families will deteriorate.

(iii) Subsidized unearned income, non-health-related

In this case, Type I families reside in an urban area where housing is heavily subsidized. In figure 1, we see that the Type I families face a lower marginal cost of health stock and are able to achieve higher health status. If structural adjustment removes these subsidies, then the health status of Type I families will deteriorate; the health status of Type II families will remain unchanged. A critical point is that the size of the shift in the marginal cost curve of Type I families depends directly on the degree of subsidy.

(iv) *Subsidized earned income, non-health-related*

Government policies may also include wage controls and other forms of earned income subsidies. As shown in equation (6), the effect on health is determined through the marginal utility of actual wealth valued at market value. The MB rather than the MC curve will be affected. The effects of family wealth on health are illustrated in figure 2. As family wealth increases, the marginal utility of wealth decreases and resources allocated to health increase, yielding a higher level of health. Changes in current income, as a component of wealth, shift the MB curve from MB_H to MB_I ; but these shifts may be limited for families with substantial savings or for families facing mild borrowing constraints.

[Insert Figure 2 here]

4.0 EMPIRICAL FINDINGS

During the past decade, various studies have attempted to examine the consequences of macroeconomic adjustments to health and nutritional status. Two studies, one of the Cote d'Ivoire and the other of the Sudan, suggest the importance of applying the social matrix framework in order to understand the relationships between changes in fiscal policy, health and health care utilization (Eltigani, 1989; Diop, 1990; Diop, Hill and Sirageldin, 1991; and Sirageldin and Diop, 1991). In the rest of this section, we briefly discuss these findings. Complete

variable specifications and empirical results for these studies are provided in an annex.

(a) The Case of the Cote d'Ivoire

During the 1970s, the Ivorian economy grew tremendously as a result of a dynamic agricultural sector and favorable international markets and rapidly growing manufacturing and service sectors (den Tuinder, 1978; and Zartman and Delgado, 1984). Confidence in the economies future performance that the cocoa and coffee boom generated led to an explosion in government spending and increased borrowing in international financial markets at relatively hard terms. However, between 1980 and 1986, the Ivorian economy suffered a severe economic crisis, and with the support of the World Bank and the International Monetary Fund, the authorities undertook a structural adjustment program (SAP) in an effort to adjust the country's macroeconomic imbalances (Lambert, Schneider, Suwa, 1991).

Public investment suffered severe cutbacks in the Ivory Coast between 1980 and 1986. The extent to which such cutbacks affected the health sector, however, is unclear. At the end of the period, primary health care investment accounted for less than 5 percent of total public health investment (Grootaert and Kanbur, 1990). There was no significant reallocation of public health resources during the period: hospital centers in Abidjan were still absorbing the bulk of public investment in health.

The economic crisis and adjustment policies seem to have affected mainly the urban families. Civil servants in Ivory Coast experienced severe cutbacks in real income during the first half of the 1980s. The Ivorian SAP introduced changes in urban housing policy, shifting the emphasis from the "high-standard housing" approach of the 1970s, which disproportionately benefitted upper income classes, toward site development targeted to lower income families. It is not clear how the adjustment process affected the incomes of families engaged in the urban informal sector. In the rural areas, however, agricultural policy components of the SAP have eventually protected the incomes of families self-employed in cash crop production.

The analysis for the Ivory Coast is based on the Living Standards Measurement Surveys (LSMS) conducted in the Ivory Coast in 1985 and 1986. The focus of the Ivory Coast study is on infant and child mortality. The probability of dying in the first year of life is used as an indicator of child health. The age-dependent nature of child-health-promoting activities and the effect of environmental contamination on child health suggests a conditional analysis based on intervals shorter than the first-year range. Consequently, two analyses are performed, one for the dependent variable: probability of neonatal death; and the second for the dependent variable: probability of postneonatal death.

Regression analyses are used to assess the changes in child health between 1970 and 1986. The analyses focus on how these

changes vary among socioeconomic groups. Maximum likelihood methods were used to fit two logistic models -- a neonatal mortality model and a postneonatal mortality model -- to the data. These indicators of health status are estimated as a function of (a) the time of birth either in the period of prosperity, 1977-1981, or the period of economic crisis, 1982-1986; (b) whether the birth is first order or seventh order and higher; (c) the sex of child; (d) whether the mother's age at birth is younger than 20 years or more than 35 years; (e) socioeconomic status: urban poor, urban nonpoor, rural poor; (f) level of savings; and (g) mother's education.

Family expenditure per capita is an indicator of family permanent income; it is used to classify families by income group. Family expenditure per capita is also used to define the rural poor and the urban poor. The rural poor is defined as families who fall within the bottom 60 percent of the distribution of family income within the rural areas. The urban poor is similarly defined using the distribution of family income in the urban areas. The ratio of the total amount of family savings over total family expenditure is used as an indicator of the availability to the family of a buffer mechanism for mitigating the effects of changes in the family's economic environment on investment in child health. Price variables were not available, so dummy variables indicating the expansionary period (1977-1981) and the economic crisis-adjustment period (1982-1986) are used to capture changes in the economic

environment of families between these two periods. The analysis is controlled for the effects of demographic variables (birth order, sex, mother's age at birth) and parent's education.

The inferential empirical approach focuses on the effects of the interaction of time variables with family socioeconomic characteristics (urban poor, urban nonpoor, rural poor and level of savings) on the likelihood of neonatal death and of postneonatal death between 1970 and 1986. For a given socioeconomic group, the deterioration of its child investment environment during the economic crisis adjustment period is expected to be reflected in the results by positive parameter estimates of the interaction of the variable indicating that the birth occurred during the crisis with the respective socioeconomic variable.

Interaction terms do not add significantly to the explanatory power of the neonatal mortality model. In contrast, they improve the fit of the postneonatal mortality model. The data support the finding that children of urban nonpoor families born during the economic crisis adjustment period experienced significantly higher postneonatal mortality than their counterparts, other things being equal. Similarly, children born to families with virtually no savings experienced heavier postneonatal mortality after controlling for other variables. These results are consistent with patterns suggested in the conceptual framework.

The occurrence of neonatal death or postneonatal death is negatively correlated with being born among the rural poor between 1982 and 1986, after controlling for the effects of other variables. These results, though weak, signal improvements in child health among the rural poor during the adjustment period.

(b) The Case of Sudan

The Sudan study demonstrates the application of the social matrix from a different perspective. A cross-sectional analysis identifies those groups who are heavily dependent on public immunization programs and those who appear to be excluded from such services. The objective of the study is to explain utilization of health care services for children (0-4 yrs) by the level of mother's education and other socio-economic characteristics of mothers and households in Gezira, Sudan. The results show that despite the predicted importance of mother's education on child health, there are equally, if not more, important variables influencing child health and demand for health services. As we will see, some of these findings can be explained by the social matrix.

Gezira is the area of land that lies between the Blue and White Niles south of Khartoum, the country's capital. Specifically, it is that part of the country which is irrigated and primarily used for cotton production, the major export of the country. Gezira enjoys a favorable allocation of health services compared to the rest of the country. Priority has traditionally

given to curative services. However, in this area, massive periodic immunization campaigns accompanied by advertising efforts started during the early 1980s. During 1985 it was estimated that immunization coverage in the Gezira region increased from 18% in 1980 to 30% in 1985.

The data for the study comes from the survey "Socio-economic Aspects of Child Health in Gezira" conducted during the period November 1986 through February 1987. A sample of 1,241 households from 31 villages and labor camps in Gezira and Managil Extension were surveyed.

The multivariate analysis tested whether the rate of child immunization depends on mother's education level, father's education, mother's economic activity, father's occupation, whether the family are migrants or native to the area, and the availability of health services in the village, the household assets, and whether the household is located in Block 27 (an area that is covered by the Blue Nile Health project activities).

Of particular interest here is the variable pertaining to migrant status. It was expected that children of migrant households would experience lower rates of immunization compared to their non-migrant counterparts because the majority of the migrants live in labor camps that are not covered by any form of health services and are likely not to be covered by immunization campaigns. Using our definitions of the social matrix, migrants would not be classified as fiscally vulnerable. Without access to public immunization services, their health is not threatened

by the removal of public services. An indication of non-fiscal vulnerability would be a significant and negative coefficient on the migrant variable, showing that migrants are generally excluded from public health care service.

Only five variables are significant including mother's education, mother's work activity, migrant status of the household, occupation of the father, and the location of the household. The migrant status of the household negatively influenced the completeness of child immunization and this impact is significant. The public immunization programs appear not to reach these households, even under relatively good economic conditions. In contrast, the evidence suggests that native households are heavily dependent on public immunizations, making them vulnerable to any decrease in public subsidization of these programs. Should fiscal support of health services fall, we would expect the non-migrant population to suffer the most. The migrant population never benefitted from these services to begin with.

5.0 CONCLUSION

Many countries starting from the late 1970's had to adjust to severe macro economic imbalances. These circumstances and adjustments created a concern as to the impact of accompanying changes in fiscal policy on past and future gains in health status in developing countries. Some have suggested that if national health status indicators are unaffected by reductions in

public subsidies for health, it is because public health services were ineffective and inefficient to begin with, or that households compensated for reduced public services by shifting to private health providers. Although these explanations may be valid, such generalizations should not be made without first examining the distributional impacts of changes in the public subsidy system. To do this, a framework for identifying and assessing the health status of those dependent on the public subsidy system is required. We have proposed that household responses to changes in public policy can best be elucidated for a given society when the "social matrix" underlying the structure of the fiscal system is adequately specified. As a basis for the social matrix, we recognize that government policy affects the availability and distribution of the proximate determinants necessary for the production of health. This means that the equity structure of the fiscal system can influence the efficiency with which health-related inputs are combined. The social matrix highlights a particular aspect of equity, namely, "fiscal vulnerability". The fiscally vulnerable are those who experience a fall in living standards (full income) as a result of a secular decrease in public expenditure.

A simplified model of household behavior is used to explain the relationships between fiscal vulnerability and efficiency in the social matrix. Using this model, four examples of changes in fiscal policy are presented to demonstrate the use of the social matrix in explaining the potential impacts of structural

adjustment programs on health. First, to the extent that changes in public expenditure for health have an impact on environmental contamination, depreciation costs of the health stock will change. Second, changes in public expenditure for health may affect the prices of medical and other health care inputs. Third, changes in non-health-related government subsidies, such as housing, affect health through the user cost of health capital; the degree of subsidies on unearned wealth is changed. Finally, government policies which affect earned income have an impact on the marginal utility of market value of wealth. Notably, the first three types of government policy changes affect the user cost of health capital. The latter affects the marginal benefits of health stock.

Evidence from two sub-Saharan African countries, the Cote d'Ivoire and the Sudan is explained in terms of the social matrix and fiscal vulnerability. In the Ivory Coast, the stabilization policies, together with economic crisis in the Ivory Coast, have lead to a decline in real income in urban areas. In contrast, rural incomes among producers of cash crops may not have been negatively affected, because agricultural policy components of the SAP have been relatively protective of agricultural incomes. As subsidies to urban consumers have been curtailed, and real income in these settings has been declining, child health in the urban areas has deteriorated, particularly in the postneonatal period. This deterioration has disproportionately affected families in the top 40 percent of urban income distribution,

mostly civil servants. In the rural areas child health has not been significantly affected by the economic crisis or adjustment policies. This finding is consistent with the notion that when families are insulated from (or marginally affected by) public services and subsidies, they will be insulated also from changes in these services and subsidies during an adjustment process.

In the case of the Sudan, empirical evidence demonstrates the notion of fiscal vulnerability by identifying those groups (native households) which are dependent on publicly supported immunization programs. In contrast, other groups (migrants) appear not have access to these programs. The implication is that should fiscal support of immunization campaigns fall, the health status of native households are likely to suffer most because public programs never reached migrant groups to begin with.

A major recommendation coming from our approach is that improved data collection and analysis of real income effects is essential. Those who benefit from the secular increase in public expenditure, a result of being in favor following shifts in political regimes (as in Chile, Nigeria or Ghana) are not necessarily the poor or deprived in the statistical description of income data. They are what we label as "fiscally vulnerable." It is this type of data on the share of government income and price subsidies in household resources that are needed for the construction of the Social Matrix, in order to analyze the effect of changes in public expenditure on household's reallocation of

their reduced real resources among the various basic commodities including their health status.

We believe that such analyses could be greatly enhanced with a deeper understanding of the political economy of governments, especially the determinants of the level, composition and distribution of its expenditures and consumption. Given the political sensitivity of such issues, analyses along these lines can help policy analysts and decision-makers evaluate issues and options, but ultimately, recipient countries must make their own fundamental value choices, a position which is increasingly recognized by major donors (Elmendorf and Lamboray, 1991).

ENDNOTES

1. In the absence of other changes, reduced government spending can be expected to slow the expansion of the provision of safe drinking water and to reduce the safety of piped water. Both effects will be stronger in urban than in rural areas, where piped water is rare. Another example deals with reduced government expenditure for the provision of affordable housing, while cost recovery increases rental payments. This is likely to increase crowding in urban areas and such crowding will increase transmission rates for airborne infectious diseases.

2. For example, if an individual purchased a house under a housing subsidy program, (W_p) would capture what he/she paid for the housing (e.g. \$9,000), (W_a) would represent the market value of the housing (e.g. \$10,000), (θ) represents the degree of subsidy, (e.g. 1.11), (s) is the subsidy rate (e.g. 11%).

$$3. \quad p(t) = \frac{m(t) + y(F^m)}{I_1} = \frac{x(t) + y(F_x)}{I_2}$$

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Table 1
THE SOCIAL MATRIX

EFFICIENCY

Marginal Benefit
of Health Stock

Marginal Cost
of Health Stock

Households living in
communities with
Public Expenditure
to Ameliorate
Community
Environmental
Conditions

--

depreciation
 $d(t;E)$

Households with
Access to Subsidized
Prices of Health-
related Inputs

--

input prices
 $p(t), \theta$

EQUITY

Households with
Access to
Subsidized unearned
income, non-health
related

--

degree of subsidy
 (θ)

Households with
Access to
Subsidized earned
income, non-health
related

marginal utility
of wealth
 (u)

--

FIGURE 1: DIFFERENCES IN CHILD HEALTH BETWEEN TWO SOCIOECONOMIC GROUPS WITH DIFFERENT EXPOSURE TO DISEASE

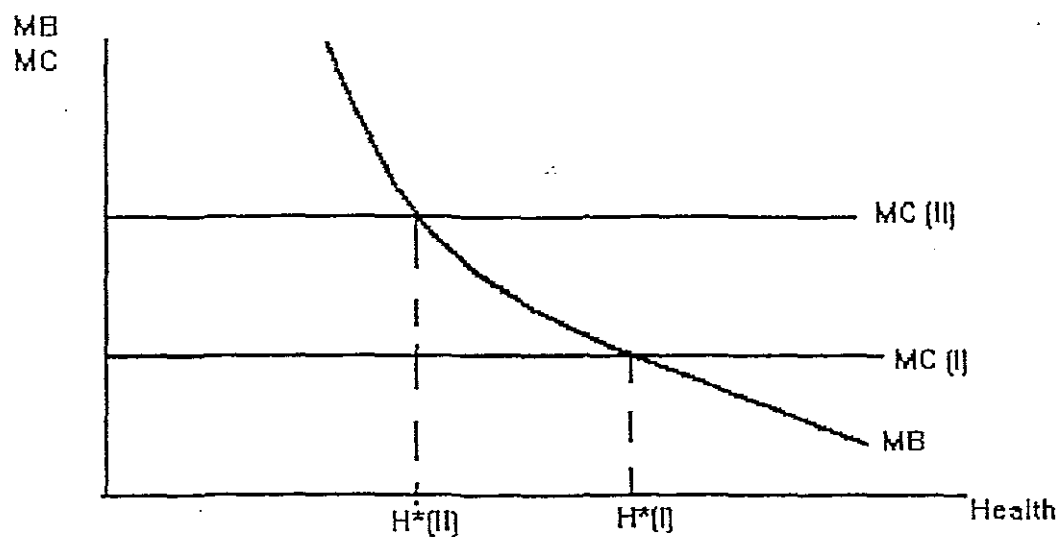


FIGURE 2: DIFFERENCES IN CHILD HEALTH BETWEEN TWO INCOME GROUPS FACING EQUAL PRICES OF CHILD HEALTH

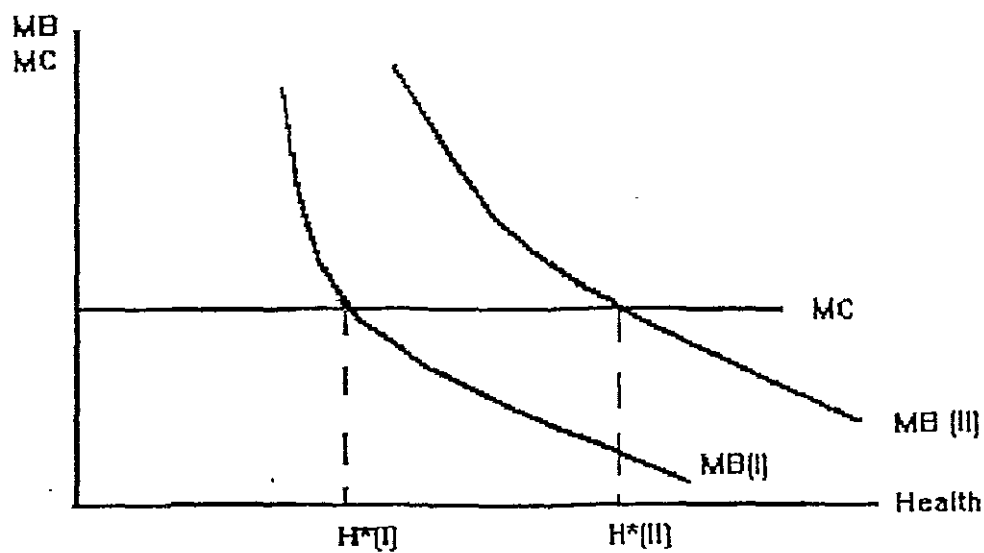


Table A-1: Cote d'Ivoire - Variables

Variable	Variable labels and values	Unit
D ₀	Neonatal death -1 if death in the first month of life, 0 otherwise.	Birth
S ₁	Exposed to post neonatal death -1 if survival up to the first month of life and born 1 year before the survey, 0 otherwise.	Birth
D ₁	Postneonatal death -1 if death between the first and the 12th months of life, 0 otherwise.	Birth
Time 2	Born between 1977 and 1981 -1 if yes, 0 otherwise.	Birth
Time 3	Born between 1982 and 1986 -1 if yes, 0 otherwise.	Birth
Ord1	First in birth order -1 if yes, 0 otherwise	Birth
Ord2	Birth order is 7th or higher -1 if yes, 0 otherwise.	Birth
Male	Sex of child is male -1 if yes, 0 otherwise.	Birth
Mageb1	Mother's age at birth is below 20 years, 0 otherwise	Birth
Mageb2	Mother's age at birth is 35 years or more -1 if yes, 0 otherwise	Birth

Table A-1: Continued

Variable	Variable labels and values	Unit
Urban1	Urban poor -1 if yes 0 otherwise.	Household
Urban2	Urban nonpoor -1 if yes, 0 otherwise.	Household
Rural1	Rural poor -1 if yes, 0 otherwise.	Household
Savings1	Ratio of savings over family expenditure is less than 1 percent -1 if yes, 0 otherwise.	Household
Savings1	Ratio of savings over family expenditure is between 1 and 5 percent -1 if yes, 0 otherwise.	Household
Meduc2	Mother's education is primary -1 if yes, 0 if otherwise.	Mother
Meduc3	Mother's education is secondary or above -1 if yes, 0 otherwise.	Mother

Source: Diop 1990

Table A-2: Cote d'Ivoire - Results

Variable	<u>Neonatal Mortality</u>		<u>Postneonatal Mortality</u>	
	Coefficient	Chi-square	Coefficient	Chi-square
Intercept	-3.39226	152.27 *	-2.80905	109.66*
Time2	0.15771	0.19	-0.28819	0.59
Time3	-0.10228	0.07	0.00759	0.00
Ord1	0.38778	5.68**	0.14689	0.62
Ord2	0.71340	22.04*	6.54**	
Male	0.14130	1.34	-0.06799	0.25
Mageb1	0.03004	0.04	0.17842	1.28
Mageb2	-0.09816	0.16	-0.16455	0.32
Urban1	-0.49365	2.31	-0.31418	1.12
Urban2	-0.01402	0.00	-1.13590	4.37**
Rural1	0.39930	2.76***	-0.19990	0.60
Savings1	0.20246	0.70	-0.12521	0.24
Savings2	0.19392	0.66	-0.32094	1.42
Meduc2	0.22020	0.73	-0.45176	1.61
Meduc3	-0.18936	0.21	-1.07151	3.11***
Time2*Urban1	0.07393	0.03	-0.45794	0.89
Time2*Urban2	-0.28729	0.30	0.65811	0.83
Time2*Rural2	-0.44130	1.53	0.35481	0.84
Time3*Urban1	0.32111	0.44	-0.46590	0.96
Time3*Urban2	0.17022	0.10	1.26450	3.69***
Time3*Rural1	-0.19119	0.24	-0.47631	1.29
Time2*Savings1	0.23976	0.46	0.35849	0.88
Time2*Savings2	-0.08854	0.06	0.21924	0.30
Time3*Savings1	0.06511	0.03	0.91607	5.43**
Time3*Savings2	0.18999	0.27	0.23648	0.29
Model Chi-square		49.73*		53.02*
Degrees of freedom		24		24
Number of observations		5,354		4,801

Table A-2 Continued

Note: A Chi-square (df-1) associated with a coefficient's estimate is the square of the ratio of the estimate over its asymptotic standard error.

Significance level: *, $< .01$; **, $[.01, .05)$; ***, $[.05, .10)$.

Dependent Variable - $\Pr(D_0 = 1)$ <neonatal mortality model>

Dependent Variable - $\Pr(D_1 = 1 | S_1 = 1)$ <postneonatal mortality model>

Source: Diop 1990

Variable	Explanation
<u>Dependent Variable</u>	
Completeness of immunization	dummy variable = 1 if child completed immunization, zero otherwise
<u>Independent Variables</u>	
<u>Mother's education</u>	
1. medu1	illiterate (reference group)
2. medu2	not complete primary
3. medu3	primary and over
<u>Father's education</u>	
1. hedu1	illiterate (reference group)
2. hedu2	not complete primary
3. hedu3	primary and over
<u>Mother's work</u>	
Mowrk	dummy = 1 if mother is working, zero otherwise
<u>Migrant status</u>	
migrants	dummy = 1 if head of household is a migrant, zero otherwise
<u>Father's occupation</u>	
1. tenant	dummy = 1 if father is tenant (reference group)
2. fwrkr	dummy = 1 if father is farm worker
3. nwrkr	dummy = 1 if father is other worker
4. wcilr	dummy = 1 if father is white collar
5. merch	dummy = 1 if father is merchant or own/account
<u>Child's sex</u>	dummy = 1 if child is male, zero otherwise
<u>Village health</u>	
vighs	dummy = 1 if village has at least dressing station
<u>Household assets</u>	
poss	Aggregate of the number of assets owned by the household
Block 27	dummy = 1 if the household is located in Block 27, zero otherwise

Table A-4

Multiple Logistic Regression Results of Child Immunization Completeness on Selected Background Variables, Gezira and Managil, Sudan 1986-87.

<u>Variable</u>	<u>Coefficient</u>	<u>Chi-square</u>
constant	-0.4954	5.01
medu2	-0.2027	1.55
medu3	0.3835	3.75**
hedu2	0.1209	0.38
hedu3	0.2496	1.99
mowrk	-0.4588	5.49**
migrant	-0.4396	3.98**
fwrkr	0.1313	0.25
nwrkr	0.2602	2.22
wellr	0.5515	4.87**
mer/own account	-0.0019	0.08
sex	-0.0199	0.02
vighs	-0.2168	1.41
poss	0.0798	1.56
Block (27)	0.5229	12.30

model chi-square 85.81**
 number of observations = 1017

**p < .05